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(72) Inventor(s):

Robert Lance Cook

David Paul Brisco

Bruce R Stewart

Lev Ring

Richard Carl Haut

Robert Donald Mack

Alan B Duell

(73) Proprietor(s):

Shell Oil Company

(Incorporated in USA - Texas)

910 Louisiana Street, Houston,

Texas 77252-2463,

United States of America

(74) Agent and/or Address for Service:

Haseltine Lake & Co

Redcliff Quay, 120 Redcliff Street,

BRISTOL, BS1 6HU, United Kingdom

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## Claims

1. An apparatus for forming a wellbore casing in a borehole in a subterranean formation, comprising:
  - means for radially expanding an expandable tubular member; and
  - 5 means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the borehole.
2. The apparatus of claim 1, wherein the means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the  
10 borehole, comprises:
  - a sliding sleeve valve.
3. An apparatus for coupling an expandable tubular member to a preexisting structure, comprising:
  - 15 means for radially expanding and plastically deforming the expandable tubular member within the preexisting structure; and
  - means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the preexisting structure.
- 20 4. The apparatus of claim 3, wherein the means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the preexisting structure, comprises:
  - a sliding sleeve valve.

What is claimed is:

1. A method of forming a wellbore casing within a borehole within a subterranean formation, comprising:
  - positioning an expandable tubular member within the borehole;
  - 5 injecting fluidic materials into the expandable tubular member;
  - fluidicly isolating a first region from a second region within the expandable tubular member;
  - fluidicly coupling the first and second regions;
  - injecting a hardenable fluidic sealing material into the expandable tubular
  - 10 member;
  - fluidicly decoupling the first and second regions; and
  - injecting a non-hardenable fluidic material into the expandable tubular member to radially expand the tubular member.
- 15 2. The method of claim 1, wherein positioning the expandable tubular member within the borehole comprises:
  - positioning an end of the expandable tubular member adjacent to the bottom of the borehole.
- 20 3. The method of claim 1, further comprising:
  - fluidicly isolating the second region from a third region within the expandable tubular member.
4. An apparatus for forming a wellbore casing within a borehole within a
- 25 subterranean formation, comprising:
  - means for positioning an expandable tubular member within the borehole;
  - means for injecting fluidic materials into the expandable tubular member;
  - means for fluidicly isolating a first region from a second region within the expandable tubular member;
  - 30 means for fluidicly coupling the first and second regions;
  - means for injecting a hardenable fluidic sealing material into the expandable tubular member;
  - means for fluidicly decoupling the first and second regions; and

means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand the tubular member.

5. The apparatus of claim 4, wherein the means for positioning the expandable tubular member within the borehole comprises:  
5 means for positioning an end of the expandable tubular member adjacent to the bottom of the borehole.

6. The apparatus of claim 4, further comprising:  
10 means for fluidically isolating the second region from a third region within the expandable tubular member.

7. A method of forming a wellbore casing within a borehole within a subterranean formation, comprising:  
15 positioning an expandable tubular member within the borehole;  
injecting fluidic materials into the expandable tubular member;  
fluidically isolating a first region from a second region within the expandable tubular member;  
injecting a non-hardenable fluidic material into the expandable tubular member  
20 to radially expand at least a portion of the tubular member;  
fluidically coupling the first and second regions;  
injecting a hardenable fluidic sealing material into the expandable tubular member;  
fluidically decoupling the first and second regions; and  
25 injecting a non-hardenable fluidic material into the expandable tubular member to radially expand another portion of the tubular member.

8. The method of claim 7, wherein positioning the expandable tubular member within the borehole comprises:  
30 positioning an end of the expandable tubular member adjacent to the bottom of the borehole.

9. The method of claim 7, wherein positioning the expandable tubular member within the borehole comprises:

positioning an end of the expandable tubular member adjacent to a preexisting section of wellbore casing within the borehole.

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10. The method of claim 7, wherein injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member comprises:

10 injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member until an end portion of the tubular member is positioned proximate the bottom of the borehole.

11. The method of claim 7, further comprising:  
15 fluidically isolating the second region from a third region within the expandable tubular member.

12. An apparatus for forming a wellbore casing within a borehole within a subterranean formation, comprising:

20 means for positioning an expandable tubular member within the borehole;  
means for injecting fluidic materials into the expandable tubular member;  
means for fluidically isolating a first region from a second region within the expandable tubular member;  
means for injecting a non-hardenable fluidic material into the expandable  
25 tubular member to radially expand at least a portion of the tubular member;  
means for fluidically coupling the first and second regions;  
means for injecting a hardenable fluidic sealing material into the expandable tubular member;  
30 means for fluidically decoupling the first and second regions; and  
means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand another portion of the tubular member.

13. The apparatus of claim 12, wherein means for positioning the expandable tubular member within the borehole comprises:  
means for positioning an end of the expandable tubular member adjacent to the  
5 bottom of the borehole.
14. The apparatus of claim 12, wherein means for positioning the expandable tubular member within the borehole comprises:  
means for positioning an end of the expandable tubular member adjacent to a  
10 preexisting section of wellbore casing within the borehole.
15. The apparatus of claim 12, wherein means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member comprises:  
15 means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member until an end portion of the tubular member is positioned proximate the bottom of the borehole.
- 20 16. The apparatus of claim 12, further comprising:  
means for fluidically isolating the second region from a third region within the expandable tubular member.
- 25 17. An apparatus for forming a wellbore casing within a borehole within a subterranean formation, comprising:  
a first annular support member defining a first fluid passage and one or more first radial passages having pressure sensitive valves fluidically coupled to the first fluid passage;  
an annular expansion cone coupled to the first annular support member;  
30 an expandable tubular member movably coupled to the expansion cone;  
a second annular support member defining a second fluid passage coupled to the expandable tubular member;

an annular valve member defining a third fluid passage fluidically coupled to the first and second fluid passages having first and second throat passages, defining second and third radial passages fluidically coupled to the third fluid passage, coupled to the second annular support member, and  
5 movably coupled to the first annular support member; and  
an annular sleeve releasably coupled to the first annular support member and movably coupled to the annular valve member for controllably fluidically coupling the second and third radial passages; and  
wherein an annular region is defined by the region between the tubular member  
10 and the first annular support member, the second annular support member, the annular valve member, and the annular sleeve.

18. An apparatus for forming a wellbore casing in a borehole in a subterranean formation, comprising:

15 means for radially expanding an expandable tubular member; and  
means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the borehole.

19. The apparatus of claim 18, wherein the means for injecting a hardenable fluidic sealing material into an annulus between the expandable tubular member and the  
20 borehole, comprises:

a sliding sleeve valve.

20. A method of operating an apparatus for forming a wellbore casing within a borehole within a subterranean formation, the apparatus comprising:

25 a first annular support member defining a first fluid passage and one or more first radial passages having pressure sensitive valves fluidically coupled to the first fluid passage;  
an annular expansion cone coupled to the first annular support member;  
30 an expandable tubular member movably coupled to the expansion cone;  
a second annular support member defining a second fluid passage coupled to the expandable tubular member;

an annular valve member defining a third fluid passage fluidically coupled to the first and second fluid passages having top and bottom throat passages, defining second and third radial passages fluidically coupled to the third fluid passage, coupled to the second annular support member, and  
5 movably coupled to the first annular support member; and  
an annular sleeve releasably coupled to the first annular support member and movably coupled to the annular valve member for controllably fluidically coupling the second and third radial passages; and  
wherein an annular region is defined by the region between the tubular member  
10 and the first annular support member, the second annular support member, the annular valve member, and the annular sleeve;  
the method comprising:  
positioning the apparatus within the borehole;  
injecting fluidic materials into the first, second and third fluid passages;  
15 positioning a bottom plug in the bottom throat passage;  
displacing the annular sleeve to fluidically couple the second and third radial passages;  
injecting a hardenable fluidic sealing material through the first, second, and third fluid passages, and the second and third radial passages;  
20 displacing the annular sleeve to fluidically decouple the second and third radial passages; and  
injecting a non-hardenable fluidic material through the first fluid passage and the first radial passages and pressure sensitive valves into the annular region to radially expand the expandable tubular  
25 member.

21. The method of claim 20, wherein positioning the apparatus within the borehole comprises:  
30 positioning an end of the expandable tubular member adjacent to the bottom of the borehole.
22. The method of claim 20, further comprising:  
positioning a top plug in the top throat passage.



23. A method of operating an apparatus for forming a wellbore casing within a borehole within a subterranean formation, the apparatus comprising:

a first annular support member defining a first fluid passage and one or more  
5 first radial passages having pressure sensitive valves fluidically coupled to the first fluid passage;

an annular expansion cone coupled to the first annular support member;

an expandable tubular member movably coupled to the expansion cone;

a second annular support member defining a second fluid passage coupled to  
10 the expandable tubular member;

an annular valve member defining a third fluid passage fluidically coupled to the first and second fluid passages having top and bottom throat passages, defining second and third radial passages fluidically coupled to the third fluid passage, coupled to the second annular support member, and  
15 movably coupled to the first annular support member; and

an annular sleeve releasably coupled to the first annular support member and movably coupled to the annular valve member for controllably fluidically coupling the second and third radial passages; and

wherein an annular region is defined by the region between the tubular member  
20 and the first annular support member, the second annular support member, the annular valve member, and the annular sleeve;

the method comprising:

positioning the apparatus within the borehole;

injecting fluidic materials into the first, second and third fluid passages;

25 positioning a bottom plug in the bottom throat passage;

injecting a non-hardenable fluidic material through the first fluid passages and the first radial passages and pressure sensitive valves into the annular region to radially expand a portion of the expandable tubular member;

30 displacing the annular sleeve to fluidically couple the second and third radial passages;

injecting a hardenable fluidic sealing material through the first, second, and third fluid passages, and the second and third radial passages;

displacing the annular sleeve to fluidically decouple the second and third radial passages; and  
injecting a non-hardenable fluidic material through the first fluid passage and the first radial passages and pressure sensitive valves  
5 into the annular region to radially expand another portion of the expandable tubular member.

24. The method of claim 23, wherein positioning the apparatus within the borehole comprises:  
10 positioning an end of the expandable tubular member adjacent to the bottom of the borehole.

25. The method of claim 23, wherein positioning the apparatus within the borehole comprises:  
15 positioning an end of the expandable tubular member adjacent to a preexisting section of wellbore casing within the borehole.

26. The method of claim 23, wherein injecting a non-hardenable fluidic material into the first fluid passage and first radial passages and pressure sensitive valves to  
20 radially expand a portion of the expandable tubular member comprises:  
injecting a non-hardenable fluidic material into the first fluid passage and first radial passages and pressure sensitive valves to radially expand the expandable tubular member until an end portion of the tubular member is positioned proximate the bottom of the borehole.

25  
27. The method of claim 23, further comprising:  
positioning a top plug in the top throat passage.

28. A method of coupling an expandable tubular member to a preexisting structure,  
30 comprising:  
positioning the expandable tubular member within the preexisting structure;  
injecting fluidic materials into the expandable tubular member;

fluidically isolating a first region from a second region within the expandable tubular member;

fluidically coupling the first and second regions;

injecting a hardenable fluidic sealing material into the expandable tubular

5 member;

fluidically decoupling the first and second regions; and

injecting a non-hardenable fluidic material into the expandable tubular member to radially expand the tubular member.

10 29. The method of claim 28, wherein positioning the expandable tubular member within the preexisting structure comprises:

positioning an end of the expandable tubular member adjacent to the bottom of the preexisting structure.

15 30. The method of claim 28, further comprising:

fluidically isolating the second region from a third region within the expandable tubular member.

31. An apparatus for coupling an expandable tubular member to a preexisting structure, comprising:

20 means for positioning the expandable tubular member within the preexisting structure;

means for injecting fluidic materials into the expandable tubular member;

means for fluidically isolating a first region from a second region within the

25 expandable tubular member;

means for fluidically coupling the first and second regions;

means for injecting a hardenable fluidic sealing material into the expandable tubular member;

means for fluidically decoupling the first and second regions; and

30 means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand the tubular member.

32. The apparatus of claim 31, wherein the means for positioning the expandable tubular member within the preexisting structure comprises:  
means for positioning an end of the expandable tubular member adjacent to the bottom of the preexisting structure.
- 5 33. The apparatus of claim 31, further comprising:  
means for fluidically isolating the second region from a third region within the expandable tubular member.
- 10 34. A method of coupling an expandable tubular member to a preexisting structure, comprising:  
positioning the expandable tubular member within the preexisting structure;  
injecting fluidic materials into the expandable tubular member;  
fluidically isolating a first region from a second region within the expandable  
15 tubular member;  
injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member;  
fluidically coupling the first and second regions;  
injecting a hardenable fluidic sealing material into the expandable tubular  
20 member;  
fluidically decoupling the first and second regions; and  
injecting a non-hardenable fluidic material into the expandable tubular member to radially expand another portion of the tubular member.
- 25 35. The method of claim 34, wherein positioning the expandable tubular member within the preexisting structure comprises:  
positioning an end of the expandable tubular member adjacent to the bottom of the preexisting structure.
- 30 36. The method of claim 34, wherein positioning the expandable tubular member within the preexisting structure comprises:  
positioning an end of the expandable tubular member adjacent to a preexisting tubular structural element within the preexisting structure.

37. The method of claim 34, wherein injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member comprises:
- 5        injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member until an end portion of the tubular member is positioned proximate the bottom of the preexisting structure.
- 10    38. The method of claim 34, further comprising:  
fluidically isolating the second region from a third region within the expandable tubular member.
39. An apparatus for coupling an expandable tubular member to a preexisting  
15    structure, comprising:  
      means for positioning the expandable tubular member within the preexisting structure;  
      means for injecting fluidic materials into the expandable tubular member;  
      means for fluidically isolating a first region from a second region within the  
20        expandable tubular member;  
      means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member;  
      means for fluidically coupling the first and second regions;  
25        means for injecting a hardenable fluidic sealing material into the expandable tubular member;  
      means for fluidically decoupling the first and second regions; and  
      means for injecting a non-hardenable fluidic material into the expandable tubular member to radially expand another portion of the tubular  
30        member.
40. The apparatus of claim 39, wherein means for positioning the expandable tubular member within the preexisting structure comprises:

means for positioning an end of the expandable tubular member adjacent to the bottom of the preexisting structure.

41. The apparatus of claim 39, wherein means for positioning the expandable  
5 tubular member within the preexisting structure comprises:

means for positioning an end of the expandable tubular member adjacent to a preexisting structural element within the preexisting structure.

42. The apparatus of claim 39, wherein means for injecting a non-hardenable  
10 fluidic material into the expandable tubular member to radially expand at least a portion of the tubular member comprises:

means for injecting a non-hardenable fluidic material into the expandable  
tubular member to radially expand at least a portion of the tubular  
member until an end portion of the tubular member is positioned  
15 proximate the bottom of the preexisting structure.

43. The apparatus of claim 39, further comprising:

means for fluidically isolating the second region from a third region within the  
expandable tubular member.

20

44. An apparatus for coupling an expandable tubular member to a preexisting  
structure, comprising:

a first annular support member defining a first fluid passage and one or more  
first radial passages having pressure sensitive valves fluidically coupled to  
25 the first fluid passage;

an annular expansion cone coupled to the first annular support member;

an expandable tubular member movably coupled to the expansion cone;

a second annular support member defining a second fluid passage coupled to  
the expandable tubular member;

30 an annular valve member defining a third fluid passage fluidically coupled to the  
first and second fluid passages having first and second throat passages,  
defining second and third radial passages fluidically coupled to the third

fluid passage, coupled to the second annular support member, and  
movably coupled to the first annular support member; and  
an annular sleeve releasably coupled to the first annular support member and  
movably coupled to the annular valve member for controllably fluidically  
coupling the second and third radial passages; and  
wherein an annular region is defined by the region between the tubular member  
and the first annular support member, the second annular support  
member, the annular valve member, and the annular sleeve.

45. An apparatus for coupling an expandable tubular member to a preexisting  
structure, comprising:

means for radially expanding an expandable tubular member; and  
means for injecting a hardenable fluidic sealing material into an annulus  
between the expandable tubular member and the borehole.

46. The apparatus of claim 45, wherein the means for injecting a hardenable fluidic  
sealing material into an annulus between the expandable tubular member and the  
borehole, comprises:

a sliding sleeve valve.

47. A method of operating an apparatus for coupling an expandable tubular  
member to a preexisting structure, the apparatus comprising:

a first annular support member defining a first fluid passage and one or more  
first radial passages having pressure sensitive valves fluidically coupled to  
the first fluid passage;

an annular expansion cone coupled to the first annular support member;

an expandable tubular member movably coupled to the expansion cone;

a second annular support member defining a second fluid passage coupled to  
the expandable tubular member;

an annular valve member defining a third fluid passage fluidically coupled to the  
first and second fluid passages having top and bottom throat passages,  
defining second and third radial passages fluidically coupled to the third

fluid passage, coupled to the second annular support member, and  
movably coupled to the first annular support member; and  
an annular sleeve releasably coupled to the first annular support member and  
movably coupled to the annular valve member for controllably fluidicly  
5 coupling the second and third radial passages; and  
wherein an annular region is defined by the region between the tubular member  
and the first annular support member, the second annular support  
member, the annular valve member, and the annular sleeve;  
the method comprising:  
10 positioning the apparatus within the preexisting structure;  
injecting fluidic materials into the first, second and third fluid passages;  
positioning a bottom plug in the bottom throat passage;  
displacing the annular sleeve to fluidicly couple the second and third  
radial passages;  
15 injecting a hardenable fluidic sealing material through the first, second,  
and third fluid passages, and the second and third radial passages;  
displacing the annular sleeve to fluidicly decouple the second and third  
radial passages; and  
injecting a non-hardenable fluidic material through the first fluid  
20 passage and the first radial passages and pressure sensitive valves  
into the annular region to radially expand the expandable tubular  
member.

48. The method of claim 47, wherein positioning the apparatus within the  
25 preexisting structure comprises:  
positioning an end of the expandable tubular member adjacent to the bottom of  
the preexisting structure.

49. The method of claim 47, further comprising:  
30 positioning a top plug in the top throat passage.

50. A method of operating an apparatus for coupling an expandable tubular  
member to a preexisting structure, the apparatus comprising:



a first annular support member defining a first fluid passage and one or more first radial passages having pressure sensitive valves fluidically coupled to the first fluid passage;

an annular expansion cone coupled to the first annular support member;

5 an expandable tubular member movably coupled to the expansion cone;

a second annular support member defining a second fluid passage coupled to the expandable tubular member;

an annular valve member defining a third fluid passage fluidically coupled to the first and second fluid passages having top and bottom throat passages, defining second and third radial passages fluidically coupled to the third fluid passage, coupled to the second annular support member, and movably coupled to the first annular support member; and

an annular sleeve releasably coupled to the first annular support member and movably coupled to the annular valve member for controllably fluidically coupling the second and third radial passages; and

15 wherein an annular region is defined by the region between the tubular member and the first annular support member, the second annular support member, the annular valve member, and the annular sleeve;

the method comprising:

20 positioning the apparatus within the preexisting structure;  
injecting fluidic materials into the first, second and third fluid passages;  
positioning a bottom plug in the bottom throat passage;

injecting a non-hardenable fluidic material through the first fluid passages and the first radial passages and pressure sensitive valves into the annular region to radially expand a portion of the expandable tubular member;

25 displacing the annular sleeve to fluidically couple the second and third radial passages;

injecting a hardenable fluidic sealing material through the first, second, and third fluid passages, and the second and third radial passages; displacing the annular sleeve to fluidically decouple the second and third radial passages; and

30

injecting a non-hardenable fluidic material through the first fluid passage and the first radial passages and pressure sensitive valves into the annular region to radially expand another portion of the expandable tubular member.

5

51. The method of claim 50, wherein positioning the apparatus within the preexisting structure comprises:

positioning an end of the expandable tubular member adjacent to the bottom of the preexisting structure.

10

52. The method of claim 50, wherein positioning the apparatus within the preexisting structure comprises:

positioning an end of the expandable tubular member adjacent to a preexisting section of a structural element within the preexisting structure.

15

53. The method of claim 50, wherein injecting a non-hardenable fluidic material into the first fluid passage and first radial passages and pressure sensitive valves to radially expand a portion of the expandable tubular member comprises:

injecting a non-hardenable fluidic material into the first fluid passage and first radial passages and pressure sensitive valves to radially expand the expandable tubular member until an end portion of the tubular member is positioned proximate the bottom of the preexisting structure.

20

54. The method of claim 50, further comprising:

positioning a top plug in the top throat passage.

25



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Examiner: David Pepper

Claims searched: 1-4

Date of search: 29 June 2004

## Patents Act 1977: Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular reference
X	1,3	US 6085838 A (Vercaemer et al) - see figs 5-7 and col 7, lines 6-22 and 52-57

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>W</sup> :

Worldwide search of patent documents classified in the following areas of the IPC<sup>07</sup>

The following online and other databases have been used in the preparation of this search report

U.S. : 166/277,382,177.4,206,207,242.2

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